Annals of Stomatology

BPI

Comparative Study

PAIN-REDUCING EFFICACY OF ANESTHETIC SPRAY VERSUS COMPRESSION TO REDUCE THE PAIN DURING TOPICAL INJECTION IN PALATAL ZONE

S.R. Tari[1], R. Scarano[1], F.S. Al-Hamed[2], F. Lorusso[1] and P. Scarano[1*]

[1]Department of Innovative Technologies in Medicine & Dentistry, University of Chieti-Pescara, Italy
[2]College of Dental Medicine, QU Health, Qatar University, Doha, Qatar

**Correspondence to:*
Paolo Scarano, DDS
Department of Innovative Technologies in Medicine & Dentistry,
University of Chieti-Pescara,
Via Dei Vestini 31,
66100 Chieti Italy
e-mail: pscarano849@gmail.com

ABSTRACT

In this study we aim to evaluate the pain-reducing efficacy of xylocaine spray versus compression to reduce the pain during topical anesthetic in palatal zone. Thirty healthy individuals needing local anaesthesia in the palatal area, participated in this comparative study. Male and female patients who consented for treatment between the age groups of 24–65 years with at least one posterior maxillary tooth extraction have been included in this study. All subject provided signed informed consent. Exclusion criteria were as follows: smoking and malignant tumours. The subjects were randomly divided into two groups: Group A: 15 patients treated with Xylocaine spray; Group B: 15 patients treated with local compression. Pain during injection and procedure satisfaction grade were recorded with visual analog scale (VAS). The patient's perceptions were scored through the SEM score. No significant differences in patient's perceptions and clinical pain were associated to the pre-anesthesia techniques ($p>0.05$). No differences regarding the procedure satisfaction were detected between the xylocaine spray vs. pressure groups ($p>0.05$).Within the limits of the present investigation, the xylocaine spray and pressure procedure were effective for the pain distress control during palatine local anesthesia.

KEYWORDS: *anesthetic spray, xylocaine, pain, palate, compression, tooth extraction*

INTRODUCTION

Local anesthesia refers to the loss of sensation caused by a reversible blockade of nerve conduction around the site of application. In dentistry, local anesthetics are administered via a variety of anesthetic techniques that are classified according to specific effects as (1) conduction anesthesia, (2) infiltration anesthesia, (3) topical anesthesia or surface

Received: 29 January 2023
Accepted: 06 March 2023

anesthesia (1). Although conduction anesthesia and infiltration anesthesia produce a deep anesthesia, the use of needles may arouse fear and pain in patients.

The thought and performance of local anaesthetic injection often provoke feelings of discomfort in the patient and have been described as one of the most anxiety-provoking procedures in dentistry (2). Acute pain depends on psychological factors, such as anxiety, fear, trust, and level of perception of stimulus, which has put forward the use of dental topical anesthesia efficacy.

On the other hand, although the intensity of the anesthesia is weak, topical anesthetics have little side effects with easy administration and reduces pain caused by needle injections and can thus generate positive responses towards dental treatment in patients (3).

Topical anaesthetic gels are frequently used in dentistry to reduce or eliminate pain during the injection procedure(2). Topical anesthetics alter pain thresholds by controlling pain sensations through a blockade of signals that are transmitted from the peripheral sensory nerve fibers. However, they are only effective in blocking the pain stimuli in the superficial layer of the mucosa. Local anesthetics that are used for topical anesthesia must have superior mucosal permeability in order to easily reach free nerve terminals (4).

Vasoconstrictors are not added to topical local anesthetics because they undermine mucosal permeability. Furthermore, topical local anesthetics are typically more concentrated than injectable anesthetics in order to promote diffusion after passing through the mucosa (5).

In addition to topical anesthesia, there are some other simple methods to diminish pain during injection, for example, local pressure on the area before injection. According to the theory of gate control, which was first presented by Melzack and Wall, local pressure could reduce pain during injection. Stimulation of A beta fibers through pressure and vibration could regulate the medullary dorsal horn, resulting in a decrease in painful nerve inputs from peripheral tissues (6, 7).

The aim of this was to compare the effect of local pressure and topical anesthesia with Xylocaine gel on pain during infiltration injection for topical anesthetic in dental nerve blocks.

MATERIALS AND METHODS

In this clinical randomized study, thirty patients were evaluated. Patients who agreed to participated in this study were randomly assigned to the study groups without considering their gender. A total of thirty healthy subjects needing local anesthesia in the posterior palatal area, participated in this comparative study. Male and female patients who consented for treatment between the age groups of 24–65 years with at least one posterior maxillary tooth extraction. All subjects provided signed the signed informed consent. The subjects were randomly divided into two groups: Group A: 15 patients treated with Xylocaine spray; Group B: 15 patients treated with local compression. Pain during injection was recorded with visual analog scale (VAS)(8, 9). Randomization was performed using the computer generated random equal numbers of blinded packages containing either of the group code. Blinded packages were prepared by the nonclinical staff according to the generated random chart and were available to the investigator only after the subject was recruited for the study.

Before administration of anesthesia in each group, one side was randomly selected as experimental and the opposite side as control. In group B, pressure was applied with the handle of the mirror until the area was ischemic on the alveolar mucosa at injection site (Fig. 1).

In group A the site was treated with xylocaine spray applied with xylocaine-soaked cotton for 5 minutes (Fig. 2).

We followed the same protocol of asking patients to keep the mouth open, and using suction apparatus to clear the pooling saliva, to maintain the adhesiveness of cotton on the mucosa. In all groups, palatal infiltration of 2% articaine with 1:200.000

Fig. 1. *Ischemic area produced on the alveolar mucosa by the pressure.*

adrenaline was carried out. All the injections were performed by a 25 mm and 27gauge needle was done. During the insertion of needle and anaesthetic infiltration, the patient's behaviour was evaluated for pain perception using sound, eye, motor (SEM) scale and visual analog scale (VAS) by the operator (Fig. 3).

Immediately after the injection, the volunteers were asked to rate their pain during needle penetration and injection on the 10 mm VAS forms. In this scale, 0 was considered as no pain, 1 to 3 as mild pain, 4 to 6 as moderate pain, and 7 to 9 as severe pain. Patient Satisfaction was validated using VAS satisfaction score which had two descriptors representing the rates of satisfaction, the patients rated his satisfaction by making vertical mark on the scale of 0 to 10, where 0 stands for not satisfy all and 10 score for completely satisfied (Fig. 4).

The VAS was chosen due to of its simplicity and as it is accepted as a standard scale for pain score. In the study, the patient's behavior was evaluated for pain perception using SEM (Sound, eye, motor) scale by the operator (Table I).

Statistical analysis

The assessment has been conducted by the statistical package GraphPad 8.0 (Prism, San Diego CA USA). The descriptive statistics has been conducted calculating the means, standard deviation and 95% Confidence Intervals of the means. The Mann Whitney test has been applied to compare the study variables means. The level of significance was considered for $p<0.05$.

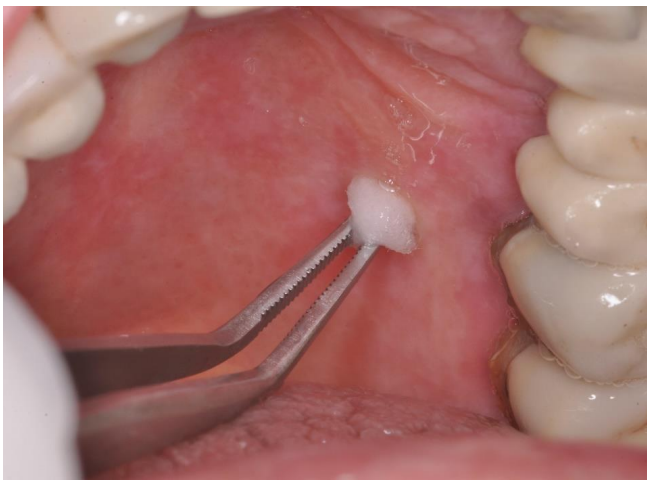

Fig. 2. *During the application of xylocaine-soaked cotton.*

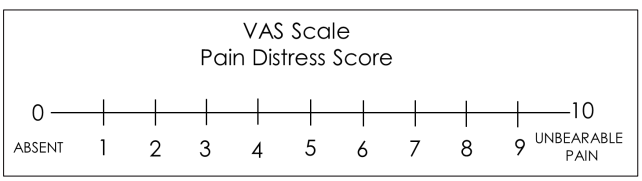

Fig. 3. *Pain VAS: Are you having during palatine injection?*

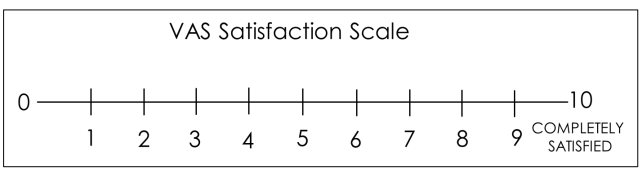

Fig. 4. *Satisfaction VAS: Are you satisfied with palatine block given during treatment?*

RESULTS

Pain score by VAS is a numerical rating scale where 0 stands for no pain and 10 represents the possible worst pain. Patient satisfaction score was also assessed by VAS. At the beginning and at the end of the scale, are two descriptors representing extremes of satisfaction where 0 stands for not satisfied at all and 10 stands for completely satisfied. The exact question which has been asked for Pain VAS and Satisfaction VAS has been mentioned.

Table I. *SEM scoring (sound, eye motor) during palatine injection*

Parameter	Comfort (1)	Mild discomfort (2)	Moderate discomfort (3)	Severe discomfort (4)
Sound	No sound	Non-specific sound	Verbal complaint, louder sound	Verbal complaint, shouting, crying
Eye	No sign	Dilateded eyes without tears (anxiety sign)	Tears, sudden eye movements	Crying, tears covering the face
Motor	Relaxed body and hand status	Muscular contraction, hands contraction	Sudden body and hand movements	Hand movement for defence turning the head to opposite side

Out of 30 patients included in the study, 14 were male and 16 were female in the age group of 24–65 years with a mean age of 6.27 years. Tables II and III show a comparison between both the test groups under VAS and SEM scales. The mean scores obtained for the group B were lower than the group A under both pain scales. However, the mean scores under both the pain scales were statistically not significant ($p > 0.05$).

Table II. *Comparison of pain determined by the anaesthesia procedures by VAS*

Group	N of patients	Mean ±SD	95% CI	P Value
A – Xylocaine spray	15	1± 0.4	(0.79-1.2)	p=0.827
B – Pressure	15	0.9±0.5	(0.68-1.2)	

Table III. *Comparison between both test groups using SEM*

Group	N of patients	Mean ±SD	95% CI	P Value
A – Xylocaine spray	15	3.7± 0.13	(3.4-3.9)	p=0.105
B – Pressure	15	4.1±0.19	(3.7-4.5)	

The pain distress associated to xylocaine spray vs. pressure group were respectively 1± 0.4 (95% CI: 0.79-1.2) and 0.9±0.5 (95% CI: 0.68-1.2) (p=0.827). The SEM scale for xylocaine spray vs. pressure group were respectively 3.7± 0.13 (95% CI: 4.4-6.5) and 4.1±0.19 (95% CI: 3.8-6.0) (p=0.105). The procedure satisfaction associated with xylocaine spray vs pressure were 5.5± 1.9 and 4.9±2.0 (p=0.447) (Table IV) (Fig. 5).

Table IV. *Comparison of satisfaction determined by the anaesthesia procedures by VAS*

Group	N of patients	Mean ±SD	95% CI	P Value
A – Xylocaine spray	15	5.5± 1.9	(4.4-6.5)	p=0.447
B – Pressure	15	4.9±2.0	(3.8-6.0)	

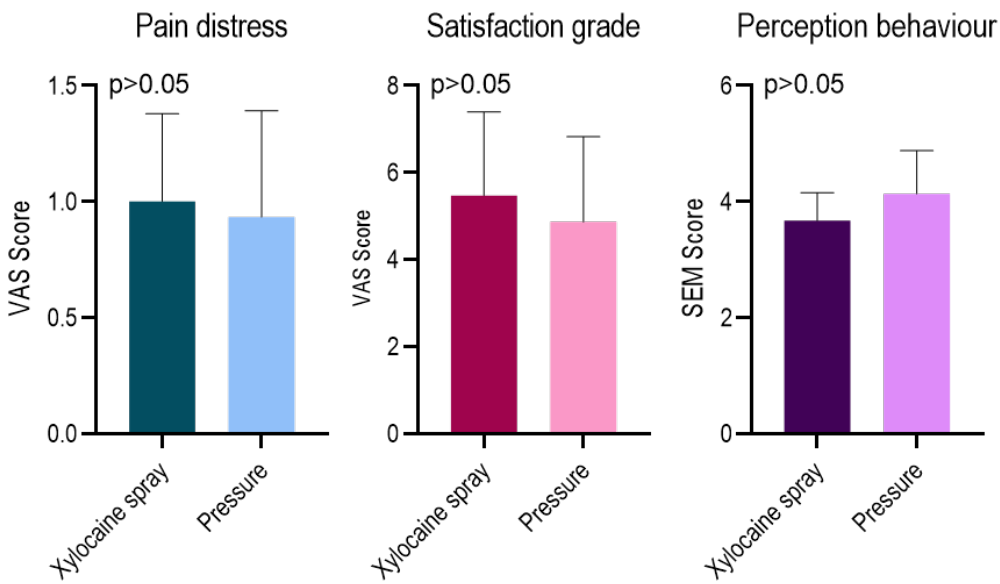

Fig. 5. *Chart summary of the VAS and SEM scoring of the xilocain spary vs pressure group (p>0*

DISCUSSION

Topical anesthetics are highly useful for reducing discomfort, pain, and anxiety during dental procedures. Traditional topical anesthetic agents with benzocaine and lidocaine as active ingredients are available in various forms and products and they should be selected based on the intended use (10). In this randomized clinical trial, we compared the effect of local pressure and Xylocaine Gel as a topical anesthetic agent on pain during infiltration injection for maxillary canine teeth. Topical anesthetics typically act for 10–15 min (11). When topical anesthetics are applied on the dried mucous membrane, they reversibly inhibit peripheral sensory nerve fibers, altering pain thresholds. Thus, the surface anesthetic action largely depends on the drug permeability (1). One method to improve the surface permeability is to alter the mode of drug delivery (12). In addition, dental anxiety and fear of needle is one of the most common problem encountered during dental extraction. Needle phobia is treated as one of the medical condition, affecting 10% populations, which can result in physiological changes like blood pressure, heart rate, ECG and stress hormones variations in the body (13).

The rationale behind investigating the effect of local pressure on pain during infiltration injection in this study was that it could be effective in reducing pain during injection, according to the gate control theory (14). One of the most primitively used technique gaining popularity is acupressure, which involves application of pressure at certain key points that stimulates the nervous system to initiate natural healing (15). It is a procedure which either involves application of pressure directly by finger in circular motion or application of consistent and constant pressure through bead/pellet at the stipulated points. The myelinated nerve fibers in muscles are stimulated with the application of pressure at acupoints which in turn will activate the midbrain and pituitary-hypothalamus via the spinal cord. Various neurotransmitters like Enkephalin, b-endorphin, Dynorphin, Serotonin, and Noradrenalin, play an important role by stimulating A^{δ} fibers situated in the skin and muscles. The A^{δ} fibers which terminate in the second layer of the black horn release the enkephalins which inhibit the incoming painful sensations (16). In conclusion the xylocaine spray and pressure are equally effective in controlling pain during the administration of local anesthesia.

REFERENCES

1. Boyce RA, Kirpalani T, Mohan N. Updates of Topical and Local Anesthesia Agents. *Dent Clin North Am.* 2016;60(2):445-471. doi:https://doi.org/10.1016/j.cden.2015.12.001
2. Bagesund M, Tabrizi P. Lidocaine 20% patch vs lidocaine 5% gel for topical anaesthesia of oral mucosa. *Int J Paediatr Dent.* 2008;18(6):452-460. doi:https://doi.org/10.1111/j.1365-263X.2007.00910.x
3. Covino BG. Pharmacology of local anaesthetic agents. *Br J Anaesth.* 1986;58(7):701-716. doi:https://doi.org/10.1093/bja/58.7.701
4. Meechan JG. Intraoral topical anesthesia. *Periodontol 2000.* 2008;46(56-79. doi:https://doi.org/10.1111/j.1600-0757.2008.00231.x
5. de Freiras GC, Pozzobon RT, Blaya DS, Moreira CH. Efficacy of Benzocaine 20% Topical Anesthetic Compared to Placebo Prior to Administration of Local Anesthesia in the Oral Cavity: A Randomized Controlled Trial. *Anesth Prog.* 2015;62(2):46-50. doi:https://doi.org/10.2344/0003-3006-62.2.46
6. Eidelman A, Weiss JM, Lau J, Carr DB. Topical anesthetics for dermal instrumentation: a systematic review of randomized, controlled trials. *Ann Emerg Med.* 2005;46(4):343-351. doi:https://doi.org/10.1016/j.annemergmed.2005.01.028
7. Juhlin L, Evers H, Broberg F. A lidocaine-prilocaine cream for superficial skin surgery and painful lesions. *Acta Derm Venereol.* 1980;60(6):544-546. doi:https://doi.org/10.2340/0001555560544546
8. Scarano A, Carinci F, Lorusso F, et al. Ultrasonic vs Drill Implant Site Preparation: Post-Operative Pain Measurement Through VAS, Swelling and Crestal Bone Remodeling: A Randomized Clinical Study. *Materials (Basel).* 2018;11(12):doi:https://doi.org/10.3390/ma11122516
9. Scarano A, Lorusso F, Arcangelo M, D'Arcangelo C, Celletti R, de Oliveira PS. Lateral Sinus Floor Elevation Performed with Trapezoidal and Modified Triangular Flap Designs: A Randomized Pilot Study of Post-Operative Pain Using Thermal Infrared Imaging. *Int J Environ Res Public Health.* 2018;15(6):doi:https://doi.org/10.3390/ijerph15061277
10. Ramacciato JG, Meechan JG. Recent advances in local anaesthesia. *Dent Update.* 2005;32(1):8-10, 12-14. doi:https://doi.org/10.12968/denu.2005.32.1.8

11. Lee HS. Recent advances in topical anesthesia. *J Dent Anesth Pain Med.* 2016;16(4):237-244. doi:https://doi.org/10.17245/jdapm.2016.16.4.237
12. Franz-Montan M, Ribeiro LNM, Volpato MC, et al. Recent advances and perspectives in topical oral anesthesia. *Expert Opin Drug Deliv.* 2017;14(5):673-684. doi:https://doi.org/10.1080/17425247.2016.1227784
13. Alla I, Lorusso F, Gehrke SA, Inchingolo F, Di Carmine M, Scarano A. Implant Survival in Patients with Chronic Kidney Disease: A Case Report and Systematic Review of the Literature. *Int J Environ Res Public Health.* 2023;20(3):doi:https://doi.org/10.3390/ijerph20032401
14. Hutchins HS, Jr., Young FA, Lackland DT, Fishburne CP. The effectiveness of topical anesthesia and vibration in alleviating the pain of oral injections. *Anesth Prog.* 1997;44(3):87-89.
15. Wang SM, Gaal D, Maranets I, Caldwell-Andrews A, Kain ZN. Acupressure and preoperative parental anxiety: a pilot study. *Anesth Analg.* 2005;101(3):666-669. doi:https://doi.org/10.1213/01.ANE.0000175212.17642.45
16. Gupta D, Dalai DR, Swapnadeep, et al. Acupuncture (zhen jiu) - an emerging adjunct in routine oral care. *J Tradit Complement Med.* 2014;4(4):218-223. doi:https://doi.org/10.4103/2225-4110.139113